

while patients suffering from the epidemic, claim on the other hand, that it resembles the nature of a small fly, which is very numerous in the infected zone, active only in the day time and during nine months of the year, commencing with the rainy season in May.

The treatment at the present time is *extirpation* of cysts, by minor operations. Twelve hours after all cysts have been extirpated, the patient completely recovers its sight.

According to present investigations, about 80,000 individuals suffer from this disease in this country, and one thousand have so far been successfully operated upon.

INCREASED SPINAL FLUID PRESSURE AS AN INDICATOR OF MENINGEAL DISEASE.*

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Increased spinal fluid pressure has long been recognized as a sign of meningeal inflammation. Its importance has been frequently emphasized but its routine use has been delayed both by difficulties in securing an accurate reading and in interpreting these findings.

In order to secure reliable readings—three factors must be considered. First, the instrument—the ordinary manometer consisting of a glass tube, but has decided disadvantages. It allows spinal fluid to escape into the tube thus decreasing the height of the reading and making it a dangerous procedure in conditions such as brain tumor, in which it may be undesirable to have spinal fluid escape. The mercury manometers are a marked improvement. We have found that the Boulette aneroid instrument has given the most satisfactory readings of any instrument we have used. It is accurate, requires about 10 drops of fluid to operate and is quite easily read.

The second important point in the securing of an accurate estimation is avoidance of pain to the patient in performing the lumbar puncture. Cocainizing the skin and deeper tissues carefully, allowing sufficient time to elapse before making puncture—all assist in preventing the patient from raising the venous pressure and thus indirectly the spinal fluid pressure. When the puncture is made and the manometer is attached, complete relaxation must be secured, waiting three to four minutes if necessary to obtain it.

With the above mentioned precautions we made over a thousand estimations of spinal fluid pressures in the Neurological Service of Stanford University Medical School.

In classifying the results we found the following groups could be made out.

Normal Cases—Patients with no clinical lesions and negative laboratory findings, registered pressure from 90 mm. of water to 140 mm. of water. Thus we hardly felt justified in designating a reading as abnormally high under 150 mm.

The *acute inflammatory lesions* of the meninges including tubercular meningitis, epidemic cerebro-

spinal meningitis, all gave uniformly high readings from 155 mm. to 350 mm. of water. This condition is as true of an aseptic meningitis produced by the injection of serum intradurally as for inflammatory states produced by organisms.

Chronic Inflammatory Lesions of the meninges including cerebrospinal lues, tabes and paresis, although not quite as constant as the above group exceed 150 mm. pressure in over 85% of the cases estimated. This group is particularly interesting in that it contains several types of cases in which the spinal fluid findings other than the pressure, are entirely negative at the time of the puncture in spite of positive clinical findings.

The first type consists of cases of "burnt out" or naturally arrested tabes.

Date	E. P. Pressure	TYPE A. M.—42695—Tabes			Nonne & Noguchi
		Cells	Wassermann		
June 6, '16	195	3	...., ...., ...., ....	..
Aug. 9, '16	165	2	...., ...., ...., ....	..
Dec. 2, '16	210	3	...., ...., ...., ....	..

Status—Irregular pupils, right larger than left—Argyll-Robertson pupil.

Romberg positive.

Achilles and patellar reflexes absent.

Lightning pains.

Gastric crisis.

The above used will serve as an example of tabes showing typical Argyll-Robertson pupil, absent achilles and patellar reflexes, Romberg sign, but exhibiting no abnormality of the spinal fluid other than an increased spinal fluid pressure, from 150 mm. to 240 mm.

Date	V. I.—29145—Pressure	TYPE B. Coreobrospinal lues.			Nonne & Noguchi
		Cells	Wassermann		
Feb. 25, '16	190	105	xxx, xxx, xx.,	x	
Mar. 7, '16	190	216	xxx, xxx, xxx,	x	
Mar. 17, '16	200	118	xxx, xxx,,	x	
Mar. 21, '16	180	Irrit. (53	...., ...., ...., ....	x	
Apr. 11, '16	190	from (51	...., ...., ...., ....	..
June 20, '16	200	Treat. (9	...., ...., ...., ....	..
Oct. 10, '16	200	1,,,	?	
Oct. 20, '16	180	1	...., ...., ...., ....	..
Oct. 12, '17	190	8	xxx,,,	?	
Nov. 12, '17	190	1,,,	?	
May 28, '18	180	5,,,	?	
Aug. 16, '18	190	3	xxx, ...., ...., ....	..
Dec. 5, '18	200	1	...., ...., ...., ....	..

Type B is typical of a class of cases of lues of the central nervous system. These cases show a normal cerebrospinal fluid temporarily during some time in their course, either when first observed or after several examinations. Here the spinal fluid pressure remains high in spite of the temporary improvement in cell count or Wasserman.

Date	E. P. Pressure	TYPE C. C.—62047—Tabes			Nonne & Noguchi
		Cells	Wassermann		
Jan. 25, '18	200	43	xxx, xxx, xx.,	x	
Feb. 1, '18	200	7	xxx, xxx, xx., ....	..
Feb. 15, '18	270	4	xxx, xxx, x.,	x	
Mar. 12, '18	190	17	xxx, xxx,,	x	
Sept. 3, '18	275	0	xxx, xxx,,	?	
Sept. 27, '18	170	1,,,	?	
Oct. 4, '18	270	1,,,	?	

Date	T. R.—30882—Pressure	TYPE C. R.—30882—Tabes			Nonne & Noguchi
		Cells	Wassermann		
Nov. 9, '15	195	44	xxx, xxx, xxx,	x	
Dec. 17, '15	195	26	xxx, xxx, x.,	x	
Dec. 3, '15		23	xxx, x.,,	?	
Dec. 27, '15		35	xxx, xxx, xxx,	x	
Jan. 11, '16	200	19	xxx,,,	x	
Feb. 1, '16	200	11	xxx, xxx, x.,	x	
Feb. 25, '16	125	25	xxx, xxx, xx.,	x	
June 3, '16	185	4	xxx, xxx, x.,	x	
May 22, '17	180	1	xxx, xx.,,	?	
June 27, '17	180	2	.., .., ...., ....	..
Nov. 13, '17	130	1	.., .., ...., ....	..
Dec. 13, '18	105	1	.., .., ...., ....	..

*Read before the Forty-eighth Annual Meeting of the Medical Society, State of California, Santa Barbara, April, 1919.

Type C represents cases of apparent permanent remission due to treatment in which the high spinal pressure is the last sign of meningeal inflammation to go.

TYPE D.

Date	Pressure	J. H. C.—65473—Tabes Cells	Wassermann	Nonne & Noguchi
May 10, '18	70	35	xxx, xxx,	x
June 14, '18	120	3	xxx, xx.,	x
June 28, '18	110	6	xxx, xx.,	?
July 23, '18	90	5	xxx, xxx,	?
Jan. 31, '19	65	1.5,	?

Type D represents about 10% of our cases of lues of the central nervous system constantly showing no increase of spinal fluid pressure in spite of clinical and laboratory evidence of disease.

The explanation of the above results depends upon our knowledge of the physiology of the mechanism of the production and absorption of the spinal fluid. This is still quite fragmentary. The author, with Dr. Howard West, in experiments of injecting phenolsulphonephthalein into the subdural space found that disease of the meninges greatly increases the time necessary for the drug to pass from spinal fluid to the kidneys. This delay we took to be proportionate to the damage done to the exits in the meninges through which the spinal fluid must pass to reach the venous circulation. According to Blackfan and Dandy these exits are located diffusely throughout the meninges of the cord and brain. Cushing and Weed feel that these communications between the spinal fluid and venous systems occur chiefly in the great sinuses. At any rate we can readily admit that whichever idea is correct, these communications are involved in a majority of cases of meningeal disease. This interference to drainage, as indicated by the lengthened absorption time of phenolsulphonephthalein and increased pressure, may persist during remissions of the disease and in some cases long after symptomatic cure either spontaneously or as the result of therapy. That about 10% of our cases of cerebrospinal lues should exhibit a consistent absence of high spinal fluid pressure could be interpreted as a failure of the disease in these cases, to involve just the area of the exits or a sufficient number of exits to radically interfere with the spinal fluid drainage.

CONCLUSION.

Increased spinal fluid pressure has an important place in our spinal fluid examination, not only in the acute stage where we have other tests to guide us, but because it is a probable indicator of a destructive process, has an important place of its own. It is especially helpful when we have clinical signs or history pointing to an old infection of the meninges or in which the usual signs of inflammation or the Wassermann reaction are normal. In the presence of a high cerebrospinal fluid pressure we have to consider the possibility of the disease being either in a state of remission or that we are dealing with an arrested or cured condition with some destructive changes.

With this information we have a better understanding of the clinical signs and subjective feelings of the patient. It also increases the accuracy of the prognosis. Increased cerebrospinal fluid pressure accurately determined has an equal value

with pleocytosis and the Wassermann reaction in acute infections of the meninges and stands alone as an indicator of destructive lesions.

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THE RAPID ADMINISTRATION OF DIGITALIS IN CARDIAC DECOMPENSATION

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Digitalis medication has suffered in the past from this drawback: that the usual doses given by mouth do not produce a physiological effect until several days have elapsed. During this lapse of time the drug is accumulating in the body and the effect does not become apparent until this accumulation has reached a certain point. Among the means that have been suggested for overcoming this difficulty are injections of digitalis preparations either subcutaneously, intramuscularly, or intravenously. Subcutaneous and intramuscular injections are usually painful, while intravenous injections are less easily given and are attended with some increased danger. In any case full doses must be given in order to attain a prompt therapeutic result. For these reasons the introduction of a method whereby digitalization can be accomplished rapidly and with comparative safety, by oral administration of the drug, is a welcome addition to the modes of giving this drug.

Eggleston in 1914, after a careful study of this problem, determined the average dose of digitalis required to produce full physiological effects. This was expressed in terms of cat units, the standard for digitalis strength that had been introduced by Hatcher and Bailey. Digitalis was administered by mouth in the usual manner and the total quantity given up to the time of producing the physiological effect was determined. Since the strength of the preparation in cat units was known, the total number of cat units received by the patient could be readily calculated. By dividing this effective dose by the body weight the effective dose per unit of weight was obtained. Eggleston found that the average effective dose was 0.148 cat units per pound of body weight. The largest and smallest effective doses, however, showed considerable variation from this average. In order to obtain a rapid digitalis effect Eggleston administered from one-third to one-fourth of the full therapeutic dose at the onset of treatment. This was followed in four to six hours with one-fourth to one-third of the full dose. The remainder was given in a few doses of smaller size at intervals of from four to six hours. In this way the full therapeutic effect of digitalis could be obtained in from twelve to thirty-six hours after beginning treatment.

More recently White and Morris have reported